

(12) UK Patent Application (19) GB (11) 2 167 377 A

(43) Application published 29 May 1986

(21) Application No 8515655

(22) Date of filing 20 Jun 1985

(30) Priority data

(31) 5403/84

(32) 14 Nov 1984

(33) DK

(51) INT CL⁴

E02F 3/40

(52) Domestic classification

B8H 501 PC

U1S 1762 1871 B8H

(56) Documents cited

GB A 2053142

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GB 1161736

GB A 2040262

GB 1472685

WO A1 83/01473

GB 1602951

(58) Field of search

B8H

(71) Applicant

Kurt & Torben Rose Holm Handels- & produktionselskab
A/S (Denmark),
Semevangen 1-3, 3540 Lynge, Denmark

(72) Inventor

Kjeld Hansen

(74) Agent and/or Address for Service

Forrester Ketley & Co,
Forrester House, 52 Bounds Green Road, London
N11 2EY

(54) A mechanism for releasably connecting a movable supporting arm to an implement, especially for connecting an excavator bucket or the like to the arm of an excavator

(57) A mechanism for releasably connecting an excavating bucket (4) to an excavating arm (1) comprises coupling means consisting of: (a) a first coupling part comprising female retaining means (10, 11), the axes of which extend transversely to the distance between them, (b) a second coupling part comprising male coupling members in the form of rods (5, 9) insertable sideways in the retaining means (10, 11) on the first coupling part, and (c) releasable blocking means (22) for preventing the rods (5, 9) from leaving the retaining means (10, 11) on the first coupling part. As shown one retaining means (10) faces away from the other, which again faces away from the distance between the two and is releasably blocked by a sole blocking means (22), being connected to a screw mechanism (not visible in the Figure) operable by a spanner or the like. The positions of the male and female members may be interchanged.

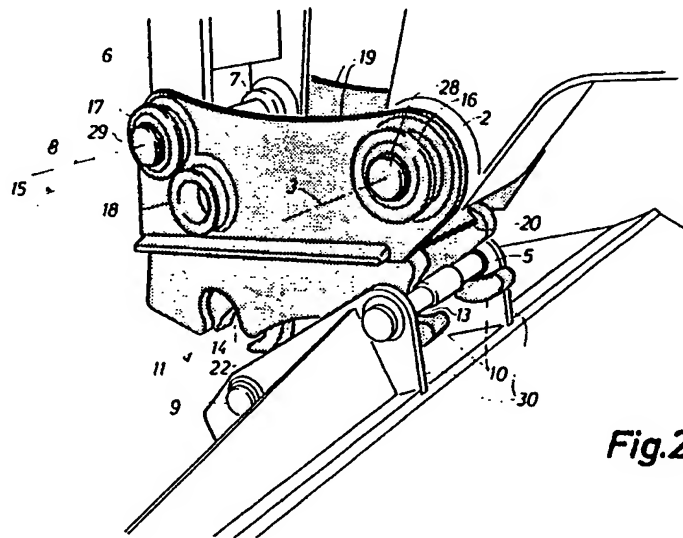
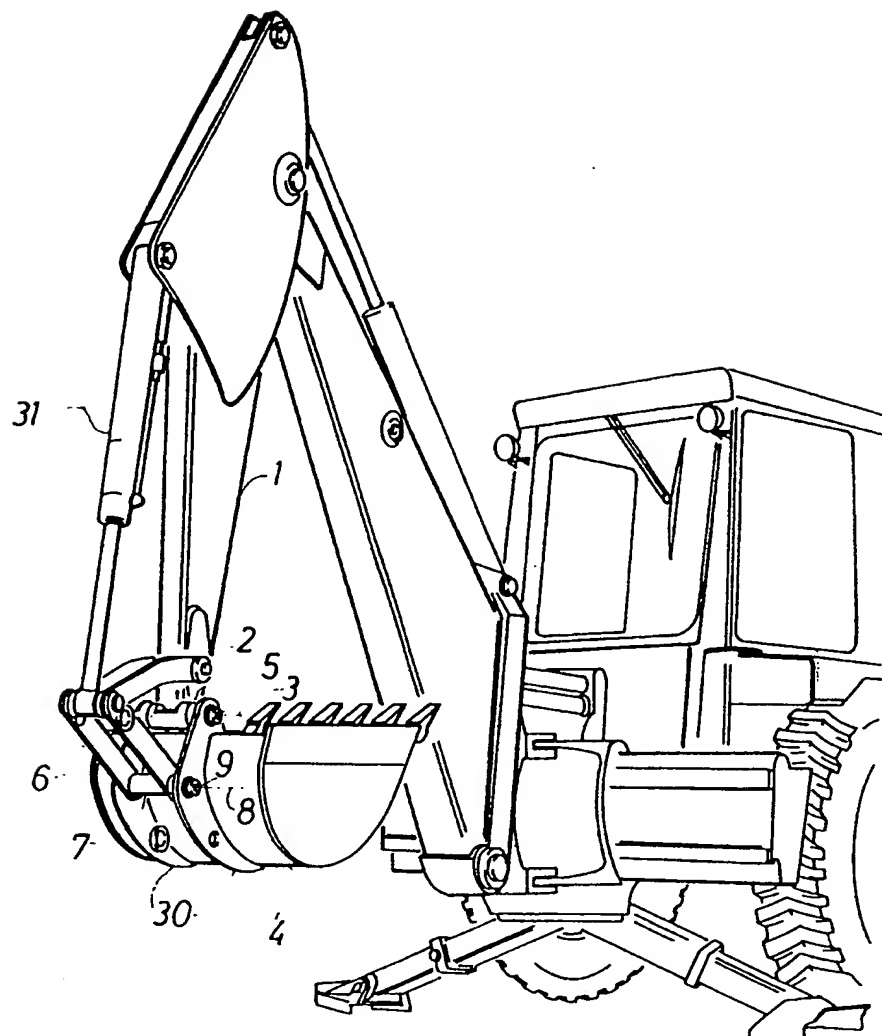
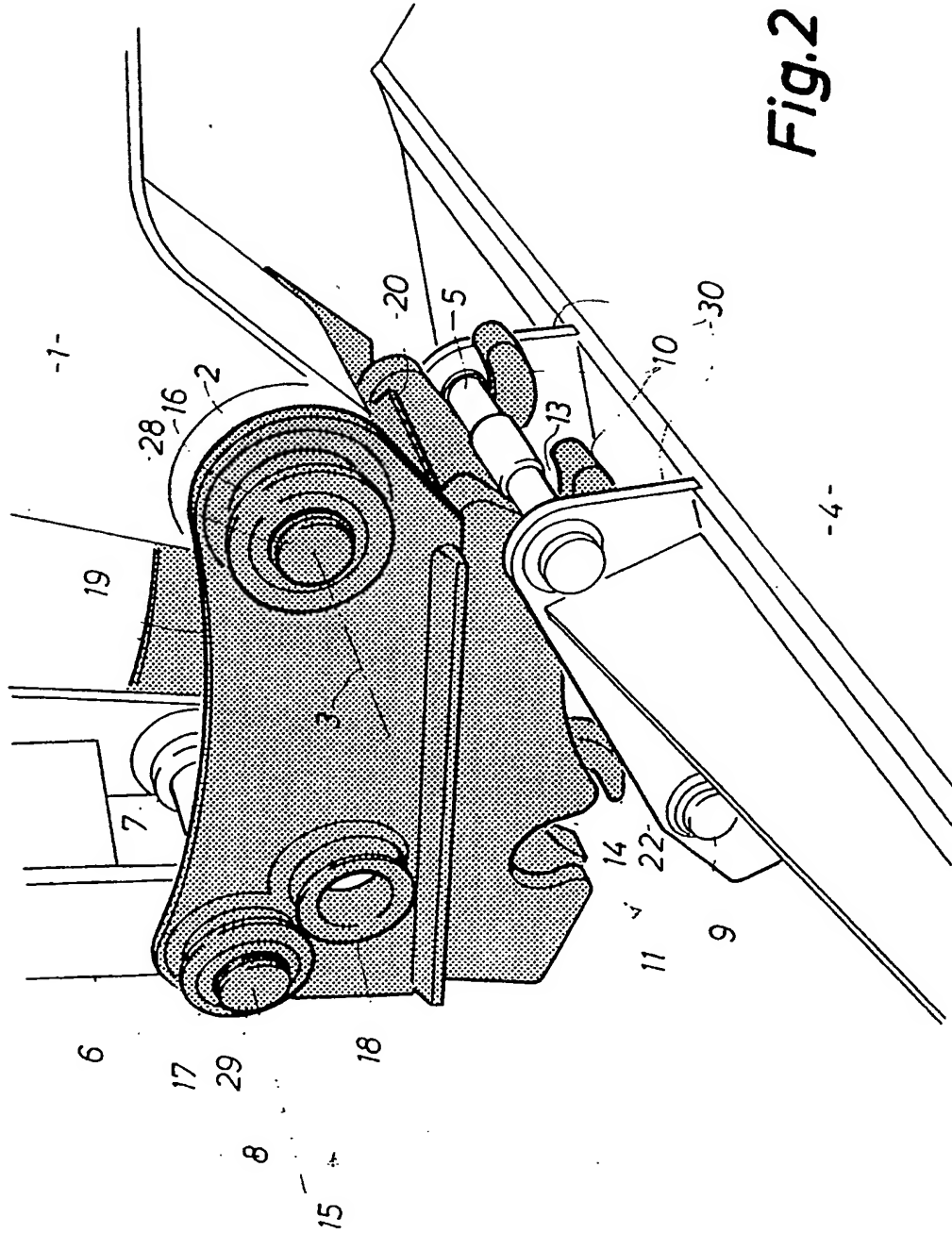


Fig.2

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*Fig.1*



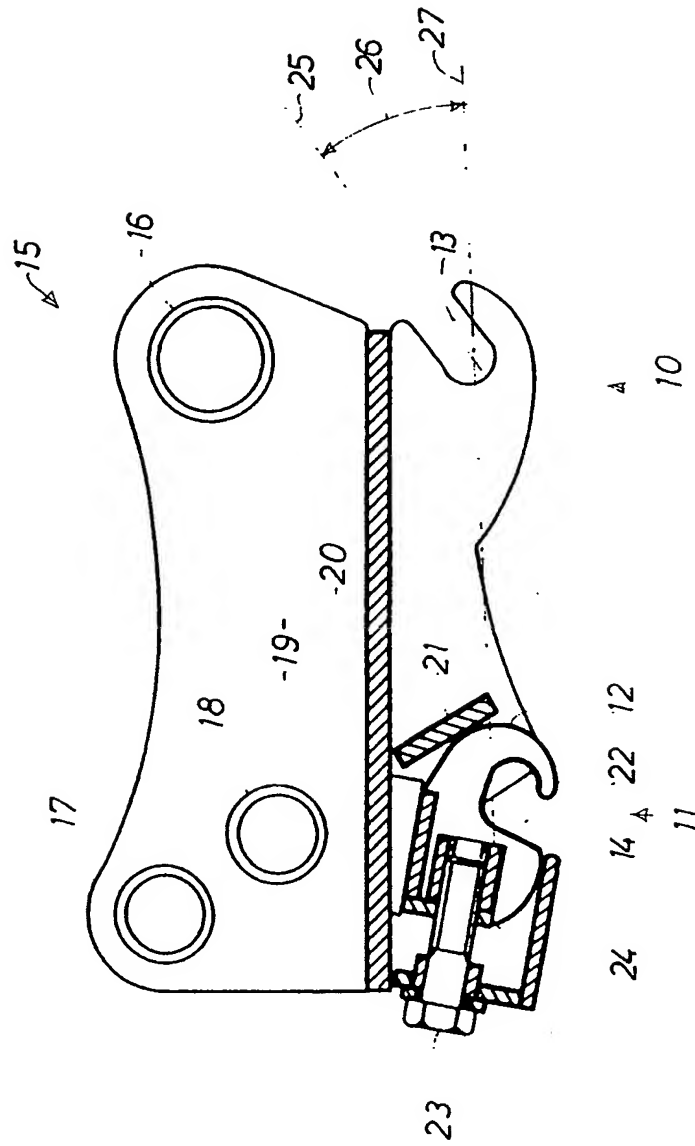


Fig.3

SPECIFICATION

A mechanism for releasably connecting a movable supporting arm to an implement, especially for connecting an excavator bucket or the like to the arm of an excavator

The present invention relates to a mechanism for releasably connecting a movable supporting arm with an implement, which mechanism is of the kind comprising at least two retaining means on said arm or on said implement, said retaining means having axes extending parallel to each other and transversely to the direction of the distance between them, and at least two rods-like members adapted to be inserted into said retaining means with their axes coaxial or parallel to said axes of said retaining means and thus constitute a connection between said arm and said implement, said implement or said arm having means for engagement with said rods or rod-like members at least when they constitute said connection.

When, in known arrangements of this type, the implement, such as an excavating bucket, a pneumatic hammer or the like, is to be released from the excavating arm, this can only be done by driving the first and the second rods or rod-like members axially out through bearing members on the arm and the implement constituting the remaining parts of the mechanism. This driving-out operation is normally carried out using impact tools, such as drift punch and a sledge hammer, and more often than not results in damage to the end of the rods, sometimes also to the bearings involved. It will be evident that with such damaged components any subsequent re-connecting will be even more difficult, and may also result in further damage to the parts concerned.

It is the object of the present invention to provide a mechanism of the kind referred to initially, which does not suffer from the disadvantages mentioned, and may be used for quick and efficient coupling and de-coupling of an implement to a movable arm.

The object stated above is attained by means of a mechanism of the kind referred to initially in which said retaining means comprise openings extending substantially at right angles to said axes of said retaining means, said rods or rod-like members are movable in directions substantially at right angles to their own longitudinal axes into and out of said retaining means through said openings, and said mechanism comprises releasable means for preventing movement of at least one of said rods or rod-like members through said openings out of said retaining means.

With such a mechanism, the coupling and de-coupling operations are carried out by moving the rods or rod-like members transversely to their own longitudinal direction in and out

of the retaining means, avoiding the axial driving-in and driving-out required in the previously known mechanisms of this kind.

In a first embodiment of the mechanism according to the present invention, the opening(s) of one retaining means face(s) substantially away from one another retaining means, the opening(s) of said other retaining means face(s) at least roughly transversely to the direction of the distance between the two retaining means, and said movement-preventing means are adapted to block the latter opening.

With this arrangement, it is sufficient to have one single movement preventing or blocking means, as the other rod or rod-like member is held in engagement with its cooperating retaining means by the very engagement of the first rod or rod-like member being held captive by said blocking means in its cooperating retaining means.

In a second embodiment of the mechanism according to the present invention, a first part of the mechanism, comprising said retaining means and said movement-preventing means, or a second part of the mechanism, comprising said rods or rod-like members, constitutes part of or is connected to said arm, and said second or first part respectively constitutes part of or is connected to said implement.

This embodiment represents two alternatives, in general functionally equivalent, but one may be preferred to the other, depending on circumstances.

In a third embodiment of the mechanism according to the present invention, the part of the mechanism connected to the arm constitutes part of an intermediate member, at one end directly connected to said arm through first bearing means and at the other end connected to said arm through an actuating member connected to said arm through a motor member, said actuating member being connected to said other end through second bearing means, the axes of said first and second bearing means being substantially parallel to each other.

With such an arrangement it is comparatively easy to modify an existing excavating arm by attaching said intermediate member—which may aptly be called an adaptor—using existing bearing members on the end of the arm and its cooperating actuating member respectively to connect the intermediate member to the arm. This means, of course, that no machining or welding operations on the arm will be required.

The present invention will now be explained in a more detailed manner with reference to the attached drawings, in which

Figure 1 in perspective shows a part of an excavator with an excavating arm carrying an implement in the form of an excavating bucket, secured to said arm using a previously known arrangement,

Figure 2 in perspective shows an intermediate member according to the present invention, attached to the lower end of the excavating arm shown in Fig. 1, and

5 Figure 3 is a longitudinal sectional view of the intermediate member shown in Fig. 2.

The un-referenced excavating tractor shown in Fig. 1 comprises in a known manner an excavating arm 1, on the outer end of which
10 there is placed a first set of bearings 2—vide also Fig. 2—in which an excavating bucket 4 is pivotably secured by means of a first bearing shaft 5 extending through a supporting flange 30 on either side of the first set of
15 bearings 2, both supporting flanges 30 being attached to the bucket 4. The pivotably supported bucket 4 may be made to move about a first bearing axis 3 corresponding to the first set of bearings 2 by means of an actuating member 6, in the example shown actuated by an actuating cylinder 31. The lower end of the actuating member 6 carries a second set of bearings 7 with a second bearing axis 8 at
20 a distance from the first bearing axis 3. A second bearing shaft 9 extends between the two supporting flanges 30 on the bucket 4 through the second set of bearings 7.

When in this known arrangement the bucket 4 is to be released from the excavating arm
30 1, e.g. in order to replace it or carry out maintenance work on it, this can only be done by moving the first bearing shaft 5 and the second bearing shaft 9 axially out through the first set of bearings 2 and the second set of bearings 7 respectively and through the corresponding openings in the supporting flanges 30. Due to the rough handling, which equipment of this kind is often subject to, strong forces are often required for driving-out the bearing shafts 5 and 9, and if the driving-out is carried out by means of e.g. a drift punch and a sledge hammer, the ends of the bearing shafts 5 and 9 can easily be damaged. This results partly in damage to the bearings concerned, partly in that the driving-out of the bearing shafts is made increasingly difficult, and—not least—that it becomes difficult to re-insert them when connecting a different excavating bucket or other implement.

50 Fig. 2 shows how this problem is solved by the present invention. In place of the interchangeable excavating bucket 4 or other implement, an adaptor 15 comprising a first bearing member 16 is pivotably secured to
55 the arm 1 by means of the first set of bearings 2, a third bearing shaft 28 extending through the first bearing member 16, so that the adaptor 15 can pivot about the first bearing axis 3 in the same manner as the bucket 4 shown in Fig. 1. The other end of the adaptor 15 carries a second bearing member 17, being linked to the actuating member 6 by means of a fourth bearing shaft 29 and the second set of bearings 7 on said actuating
60 member 6. The side of the adaptor 15 facing

downwards in Fig. 2 is provided with first and second retaining members 10 and 11 respectively. In this connection reference is also made to Fig. 3, showing a locking means 12 placed adjacent said second retaining member
70 11.

The adaptor 15 may be coupled to the excavating bucket 4—of which only a part is shown in Fig. 2—by moving the arm 1 with the adaptor in the approximately horizontal position shown in such a manner that the first retaining member 10 with its openings 13 engages the first bearing shaft 5, which may here be permanently secured to the supporting
75 flanges 30. The adaptor 15 will now take up the position shown in Fig. 2, from which it may be swung counter-clockwise by moving the actuating member 6 downwards, so that the second retaining member 11 with its
80 openings 14 engages the second bearing shaft 9, which now likewise may be permanently secured to the supporting flanges 30 on the excavating bucket 4.

The next step consists of blocking the
90 openings 14 by means of a blocking member or hook 22 that is part of the locking member 12 and may be moved from the open position shown in Fig. 3 to a closed position (not shown) by means of a bolt with a hexagonal
95 head 23 and a screw mechanism 24 cooperating with said bolt.

After the completion of this coupling operation the excavating bucket 4 may be manoeuvred in the same manner as in the known arrangement shown in Fig. 1, except for the insignificant difference that the distance between the bucket 4 and the two bearing axes 3 and 8 is slightly larger—which may be compensated for by shaping the bucket in a suitable manner.
100 105

When the excavating bucket 4 is to be released from the arm 1, it is insufficient to repeat the operations mentioned above in reverse and in the opposite sequence, and it will be apparent that the risk of damage to the components in question is a minimum, since there is no need to use impact on them.

As will be evident from Fig. 3 it is sufficient to place a blocking member 22 adjacent the
115 opening 14 extending generally transversely to the distance between the openings 14 and 13, since the bearing shaft 9 after having been inserted in the opening 14 will prevent the bearing shaft 5 from leaving the opening
120 13, and it is now sufficient to prevent the bearing shaft 9 from leaving the opening 14, which in the example shown is done by means of the blocking member 22. In practice, it has been found expedient—*inter alia* for facilitating the coupling operation shown in Fig. 2—to place the openings 13 with their entry and exit direction 25 at an acute angle 26 with a plane 27 through the bottom regions of the openings 13 and 14. The angle 26 may, as shown in Fig. 3, be of the order
125 130

of magnitude of 30°.

In the example shown, the adaptor 15 is constructed from two plate-shaped side members 19, being kept at a suitable mutual distance by means of spacing webs 20 and 21. In addition to the second bearing member 17 the adaptor 15 comprises an alternative second bearing member 18 at a somewhat smaller distance from the first bearing member 16. By using the alternative second bearing member 8 it is possible in an otherwise known manner to obtain a higher movement ratio between the actuating member 6 and the implement—in the example shown the bucket 4—connected to the adaptor 15.

Both the first bearing shaft 5, the second bearing shaft 9, the third bearing shaft 28 and the fourth bearing shaft 29 are advantageously more or less permanently secured in the positions shown in Fig. 2, e.g. by using suitable known means (not shown).

The spacing web 21 shown in Fig. 3 serves in addition to a "fool-proofing device", as it prevents the locking member 12 with the hook 22 from falling out of the adaptor 15, should the bolt with the hexagonal head 23 be turned too far in the unblocking direction. From Fig. 3, it will also be evident that the force exerted by the locking member 12 on the second bearing shaft 9 when the bolt 23 is being tightened—see also Fig. 2—will pull the first bearing shaft 5 to bear against the bottom of the opening 13 and thus prevent slack between the adaptor 15 and the implement, in the example shown the excavating bucket 4.

In the preceding description the present invention has been explained with reference to the use of an adaptor 15 inserted between on the one hand the implement-carrying-arm 1 and the actuating member 6, being constructed according to common principles used up to now, and on the other hand the implement—in the example shown the excavating bucket 4—likewise constructed according to common principles used up to the present. It does, however, lie within the scope of the invention to alter the bearings 2 and 7 respectively on the arm 1 and the actuating member 6 in such a manner that the first and second bearing shafts 5 and 9 respectively may be moved into and out of respective bearings in a direction transverse to their own longitudinal direction and be retained in the respective bearings by suitable locking means. If so, it may become necessary to use one locking member corresponding to the locking member 12 for each bearing, since the distance between the bearings 2 and 7 is not determined in the same manner as the distance between the openings 13 and 14 is determined by the adaptor 15 extending between them. It will, however, be possible to use the arrangement shown in Fig. 3, provided that a rigid link corresponding to the part of the adaptor 15

extending between the two bearing members 16 and 17 is placed between the bearings 2 and 7.

Further, the following should be noted:

While the present invention has been explained with reference to a practical embodiment, in which the "male" members—i.e. the bearing shafts 5 and 9—are attached to the bucket 4, and the "female" members—i.e. the retaining members 10 and 11—are connected to or situated on the excavating arm 1, it also lies within the scope of the invention to interchange the positions of these two sets of cooperating coupling means.

CLAIMS

1. A mechanism for releasably connecting a movable supporting arm with an implement, which mechanism comprises at least two retaining means on said arm or on said implement, said retaining means having axes extending parallel to each other and transversely to the direction of the distance between them, and at least two rods or rod-like members adapted to be inserted into said retaining means with their axes coaxial or parallel to said axes of said retaining means and thus constitute a connection between said arm and said implement, said implement or said arm having means for engagement with said rods or rod-like members at least when they constitute said connection, in which mechanism said retaining means comprise openings extending substantially at right angles to said axes of said retaining means, said rods or rod-like members are movable in directions substantially at right angles to their own longitudinal axes into and out of said retaining means through said openings, and said mechanism comprises releasable means for preventing movement of at least one of said rods or rod-like members through said openings out of said retaining means.

2. A mechanism according to Claim 1, wherein the opening(s) of one retaining means face(s) substantially away from another retaining means, the opening(s) of said other retaining means face(s) at least roughly transversely to the direction of the distance between the two retaining means, and said movement-preventing means are adapted to block the latter opening.

3. A mechanism according to Claim 1 or 2, wherein a first part of the mechanism, comprising said retaining means and said movement-preventing means, or a second part of the mechanism, comprising said rods or rod-like members, constitute part of or is connected to said arm and said second or first part respectively constitutes part of or is connected to said implement.

4. A mechanism according to Claim 3, wherein the part of the mechanism connected to the arm constitutes part of an intermediate member, at one end directly connected to

said arm through first bearing means and at the other end connected to said arm through an actuating member connected to said arm through a motor member, said actuating member being connected to said other end through second bearing means, the axes of said first and second bearing means being substantially parallel to each other.

5. A mechanism according to Claim 4, wherein said second bearing means comprise at least two bearing members situated at different distances from a bearing member constituting part of said first bearing means.

6. A mechanism according to any one of claims 2-5, wherein the entry and exit direction of the first-mentioned opening(s) forms an acute angle through a plane through the bottom regions of the first-mentioned opening(s) and the secondly-mentioned opening(s), said angle lying on the side of said plane facing away from the entry and exit parts of said second opening(s).

7. A mechanism according to any one of claims 4-6, wherein said intermediate member mainly consists of two substantially plane side members being held apart from and substantially parallel to each other by suitable spacing members, said bearing members constituting parts of said first and second bearing means are placed adjacent to one edge of said members, and said part of the mechanism connected to said arm is placed adjacent the opposite edge of said side member.

8. A mechanism for releasably connecting a movable supported arm to an implement, substantially as hereinbefore described with reference to the accompanying drawings.

9. Any novel feature or combination of features herein described or shown.